IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	Not Yet Assigned
Applicants	:	**Hyung-Jun KIM et al.**
Filed	:	Concurrently Herewith
Title	:	**COLD SPRAY APPARATUS HAVING POWDER PREHEATING DEVICE**
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PRELIMINARY AMENDMENT

Sir:

Prior to initial examination, please amend the above-identified patent application as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims begin on page 5 of this paper.

Amendments to the Abstract begin on page 6 of this paper and a replacement page is attached hereto.

Remarks begin on page 7 of this paper.

AMENDMENTS TO THE SPECIFICATION

Please replace the paragraph beginning at page 1, line 5 with the following rewritten paragraph:

-- The present invention relates to a cold spray apparatus having a powder preheating device. ~~In more~~ More particularly, the present invention relates to a cold spray apparatus having a powder preheating device, capable of obtaining a high deposition rate and an excellent coating layer under the same spray processing conditions by preheating the coating powder before ~~a~~the coating process. --

Please replace the paragraph beginning at page 1, line 12 with the following rewritten paragraph:

-- A thermal spray coating method is widely used to coat material ~~to~~on a substrate. In the thermal spray coating method, a substrate that is a parent material is roughened by a blasting process and is coated by a mechanical bonding. That is, a powder is melted by several heat sources, such as electric arc and plasma, and then is sprayed on the substrate at high velocity. In this manner, the powder is coated on the substrate. --

Please replace the paragraph beginning at page 2, line 20 with the following rewritten paragraph:

-- U.S. Pat. No. 6,365,222 B1 discloses a process of repairing components using a cold spray technique, and U.S. Pat. No. 6,491,208 B2 discloses a process of repairing turbine blade. Also, U.S. Pat. Nos. 6,139,913 and 6,283,368 disclose a nozzle that can accelerate gas to high velocity in the range of 1000 m/sec or more. Those patents can be applied to powder particles having size of 50 μm or more. In addition, those patents ~~discloses~~disclose a cross-sectional area ratio of a main gas passage to an injection tube in a mixing chamber for mixing the accelerating gas and the coating particles. --

Please replace the paragraph beginning at page 3, line 12 with the following rewritten paragraph:

-- First, there is a limit to usable materials because solid materials are used in the cold spray techniques. Specifically, ceramic is very difficult to use in the cold spray technique, while pure copper, nickel or aluminum is widely used because of ~~its high~~their higher ductility. --

Please replace the paragraph beginning at page 4, line 4 with the following rewritten paragraph:

-- However, if the method alone is used, it is difficult to obtain a satisfactory deposition rate, especially in the coating of cermet materials. Accordingly, the gas heater must heat the gas ~~more~~still higher so as to increase gas temperature, resulting in an increase of the power consumption. In addition, a~~t~~he lifetime of a tube in the gas heater is shortened and thus there is a limit in the increase of temperature. --

Please replace the paragraphs beginning at page 5, line 15 and ending at line 25 with the following rewritten paragraphs:

FIG. 1 is a schematic view of a cold spray apparatus having a powder preheating device according to a preferred embodiment of the present invention~~.~~;

FIG. 2 is a perspective view of the powder preheating device shown in FIG. 1~~.~~;

FIG. 3 is a photograph showing a sectional structure of a coating layer, which is formed after an etching by the comparative example 4 of Table 5~~.~~;

FIG. 4 is a photograph showing a sectional structure of a coating layer, which is formed after an etching by the inventive example 8 of Table 5~~.~~;

FIG. 5 shows a result of an X-ray diffraction analysis on a coating layer, which is formed by the comparative example 4 of Table 5~~.~~; and

FIG. 6 shows a result of an X-ray diffraction analysis on a coating layer, which is formed by the inventive example 8 of Table 5.

Please replace the section heading at page 5, line 27 with the following rewritten section heading:

-- ~~DISCRIPTION OF PREFERRED EMBODIMENTS~~DETAILED DESCRIPTION OF THE INVENTION --

Please replace the paragraph beginning at page 11, line 13 that continues onto page 12 with the following replacement paragraph:

-- As can be seen from Table 2, when only the powder preheating conditions are changed while all other conditions are equal, the deposition rate and the coating thickness are rapidly increased as the powder preheating temperature is increasing. Specifically, the comparative example 1 has the porosity of 5%, which is ~~very~~significantly higher than those

PA 9 continued

of the inventive examples. Thus, ~~the~~in comparative example 1, ~~is~~it was difficult to form a dense coating layer. --

Please replace the paragraph at page 13, line 9 with the following replacement paragraph:

-- In order to check the test results more thoroughly, the sections of the structures coated by the comparative example 2 and the inventive example 6 were observed by a microscope. Their results are shown in FIGs. 3 and 4. That is, FIG. 3 is a photograph showing the sectional structure of the coating layer, which is formed by the comparative example 2, and FIG. 4 is a photograph showing the sectional structure of the coating layer, which is formed by the inventive example 6. It can be seen that the structure of FIG. 3 is ~~not denser~~less dense than that of ~~Fig.~~FIG. 4. Also, the structure of FIG. 4 maintains the nano-structure well. Accordingly, the coating layer of the present invention ~~can have the~~provides excellent coating thickness and hardness. In addition, unlike the thermal spray coating method, the transformation of the nano-structure does not ~~almost~~substantially occur. --

PA 1

Please replace the paragraph at page 13, line 22 with the following replacement paragraph:

-- In order to compare the cold spray method of the present invention with the conventional thermal spray coating method, ~~the~~a test was performed under the conditions ~~of~~set forth in Table 5 below. Other ~~condition to perform~~ cold spray coating conditions were ~~the~~is same as ~~that~~those of Table 3 according to the composition of WC-Co. --

PA 2

Please DELETE the section heading at page 15, line 18.

PA 3

Please replace the paragraph at page 15, line 19 with the following replacement paragraph:

-- The present invention ~~can provide the~~provides a cold spray apparatus and method, that ~~can solve~~solves the problem of the conventional thermal spray coating method in which the compound and structure of the particles in the conventional method are transformed so that it is difficult to form the desired coating layer. In addition, the cold spray apparatus and method of the present invention ~~can~~ effectively and economically ~~form~~forms the coating layer that can solve the problems of ~~the~~ poor porosity and deposition rate. --

PA 4